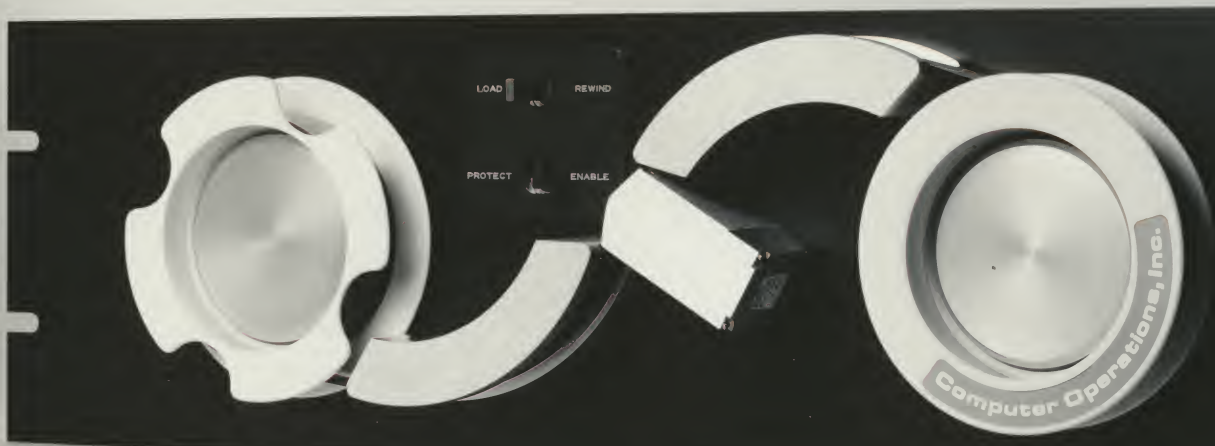


\$390



Computer Operations, Inc.

SJ 71

CO600A LINC TAPE SYSTEM



The CO-600A LINC Tape System offers mini-computer users a highly reliable direct access mass memory system. Economical reels of pre-sectored tape are used to create a disc format. Each sector is automatically, through hardware, located by a permanently recorded sector number. Data transfers with the computer proceed for the number of sectors required by the program. The data path with the computer may be via the usual programmed I/O bus or with a direct memory access channel. The basic system consists of a master dual drive assembly and control electronics.

THE MAIN FEATURES OF THE SYSTEM ARE:

Bi-directional, automatic, high speed
direct access to any sector

Update any sector(s) directly

Hardware 16 bit algebraic checksum
recorded and verified for each block

Fully redundant recording for
reliability (10 channel head)

Sandwich tape for long tape and head life

204,800 eight bit bytes/reel
(102,200 16/18 bit words/reel)

150 feet of tape of 4" reel

Transfer rate: 8,400 bytes/sec
(4,200 16/18 bit words/sec)

8 or 16 parallel interface

66 msec. sector traverse time
(256 word sectors)

Permanent, pre-recorded sector addresses

Up to 16 selectable transports—
field expandable

3,276,800 bytes of storage in
fully implemented system

Economical, easy threading reels of tape

Phase recording at 400 BPI

60 inches/sec tape speed

DESCRIPTION

The basic CO-600A LINC Tape System consists of a master dual tape transport and controller in a single 8-3/4" rack mounting assembly. Expansion is by means of additional pairs of tape transports which simply plug in to the master unit in a daisy-chain arrangement. Up to 7 additional pairs of transports may be added to increase the total capacity to 16 drives.

The controller is connected to the computer I/O system through a small interface. Computer Operations, Incorporated can supply these interfaces for your particular computer completed with all required cables.

A typical transfer of information between the tape and computer proceeds as follows:

1. Program loads Sector Address Register with the number (address) of the first desired sector.

10 Bits S.A.R.

2. Program loads the Command Registers in the controller with bits assignments as follows:

6 Bits	Number of Sector (1-63)
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4 Bits	Drive Select (0-15)
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2 Bits	Mode—Read, Write, Verify, Stop
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These registers may be loaded in parallel or individually, depending on the actual interface design.

When the Mode register is loaded, the selected drive will automatically start and locate the sector specified by the Sector Address Register. The six bit Number of Sectors field determines how many consecutive sectors (up to 63) will be transferred or verified. If a zero is loaded into the "Number of Sectors" register, the tape will move to the sector number specified in the Sector Address Register and stop. This mode is useful for pre-positioning the tape prior to actual access.

The Read and Write modes select the appropriate transfer direction. The 16 bit checksum is automatically generated and written in each sector during writing and checked during reading.

If the Verify mode has been selected, the requested number of sectors will be verified by adding the data words in each sector and comparing this sum with the checksum word recorded at the end of each sector. Any error will set the Checksum Error bit in the Status Register. This mode may be used after writing a series of sectors to insure the correctness of the recorded data.

The Stop mode will halt the tape immediately. This would be used if an error had been detected during the reading or verifying a string of sequential sectors. When the selected operation is complete, the tape will automatically stop.

A four bit status register is available to the programmer to enable the sensing of various internal conditions in the system. The bit assignments are as follows:

Busy	Transferring	Checksum Error	Select Error
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The Busy bit indicates that there is tape motion and that the last command is being executed. The Transferring bit indicates that the first sector has been located and that the data transfers are under way. When the transfer is complete, this bit is turned off. If Busy is on and Transferring is off, the system is searching for the first specified sector. The Checksum Error bit is turned on if a checksum error occurred during a Read or Verify operation. The first block to produce a Checksum Error in a sequence sets the Checksum Error bit. If a drive is selected and it is in the off or unloaded condition, the Select Error bit will be set. No motion will occur on this drive.

DIRECT ACCESS FEATURE

Any sector or string of sectors may be read or written without the possibility of disturbing adjacent sectors. The pre-recorded sector address allows perfect positioning of the tape for each sector so that truly direct access is achieved. The sector address is actually recorded at each end of every sector to permit bi-directional searching. When the desired sector has been located in the reverse direction, the tape motion is automatically reversed, and the actual data transfer takes place in the forward direction at an 8.4kHz byte rate or 4.2kHz 16/18bit word rate.

RELIABILITY

The LINC Tape System has several features which contribute to its unparalleled reliability. A ten channel head is used to record five data tracks. Each track is recorded twice and upon reading, the corresponding head outputs are added together. Should a drop-out occur, the signal from one track is sufficient to insure proper operation. In addition to the fully redundant tracks, the track organization eliminates the effects of skew. The timing clock is recorded on the two tracks furthest from the center of the head. Should the tape skew, the output signal only widens slightly.

A high quality mylar sandwich tape is used to protect both the oxide and head from wear. A very thin layer of mylar between the oxide and head completely eliminates tape oxide loss. This results in almost infinite tape life and prevents oxide build up on the head.

A recording density of 400 BPI allows for simplified read amplifiers and eliminates critical deskewing adjustments. A phase or polarity sensed recording technique is used instead of NRZ methods.

In order to provide an actual check of data recorded on the tape, a 16 bit algebraic checksum is recorded at the end of each written sector. The summation of the data words in the sector is performed by hardware in the controller, not by the computer. Upon reading or verifying a sector, the checksum is recalculated, and compared with the one originally recorded during writing. As long as the two words agree, the Checksum Error bit in the status register will not be set. A mismatch will set the Checksum Error bit until the next command word is sent to the controller.

APPLICATIONS

The CO-600 LINC Tape System is a solution to mass storage problems in widely diverse application areas. These include:

Inventory Control

Accounting

Sort/Merge

Operating Systems and Libraries

Program Load/Dump

Information Storage and Retrieval

Program and Text Editing

Data Logging

Program Overlay

CO600P PROGRAM CONTROLLED LINC TAPE SYSTEM

A simplified version of the LINC Tape System is available that uses the computer to perform the sector search and checksum calculations. A simple subroutine is used to compare the sector address with the desired address. When the match is obtained, data transfer proceeds between the tape and the computer. While writing, the computer calculates the checksum by adding all 16 bit words over the sector and then writing this checksum at the end of the sector. While reading, the incoming data is again added and the total compared with the previously written checksum. A match indicates that the sector just read is correct.

The CO600P LINC Tape System is available with an optional checksum generation and checking hardware. This permits operation or direct memory access channels without the requirement for program intervention. Sector search is by program control as described above.

The LINC Tape control subroutines have been written for several of the popular mini-computers. Complete flow charts of the routines are available to simplify the coding for other computers. A complete set of drive select, sector search, read, and write routines requires approximately 200_{10} locations in a typical 16 bit machine.

All programmed LINC Tape systems are available with interfaces for specific computers. These systems are tested with the corresponding computer before shipment.

PHYSICAL SPECIFICATIONS

Height	8-3/4"
Width	19"
Depth	12" (From Rack Rails)
Front Projection	2-1/8"
Power	115 $\pm$ 10%, 60Hz @ 200 Watts